

## General

### Title

Acute myocardial infarction (AMI): hospital-level, risk-standardized payment associated with a 30-day episode of care for AMI.

### Source(s)

Yale New Haven Health Services Corporation (YNHHSC), Center for Outcomes Research and Evaluation (CORE). 2017 measure updates and specifications report: hospital-level risk-standardized payment measures. Baltimore (MD): Centers for Medicare & Medicaid Services (CMS); 2017 Mar. 94 p.

## Measure Domain

### Primary Measure Domain

Related Health Care Delivery Measures: Cost

### Secondary Measure Domain

Does not apply to this measure

## Brief Abstract

### Description

This measure estimates a hospital-level risk-standardized payment (RSP) for an acute myocardial infarction (AMI) episode of care starting with inpatient admission to a short term acute-care hospital and extending 30 days post-admission for Medicare Fee-for-Service (FFS) patients discharged from the hospital with a principal discharge diagnosis of AMI.

The Centers for Medicare & Medicaid Services (CMS) annually reports the measure for individuals who are 65 years and older and are Medicare Fee-for-Service (FFS) beneficiaries hospitalized in non-federal short-term acute care hospitals (including Indian Health Services hospitals) and critical access hospitals.

### Rationale

Medicare spending is estimated to have been \$525.0 billion in 2010 with annual growth rates projected to be 6.3% for 2013 through 2020 due to both an increase in the Medicare population as well as Medicare

spending on each beneficiary (Ash & Byrne-Logan, 1998). Further projections anticipate an exhaustion of Medicare's Hospital Insurance Trust Fund (Part A) by 2024 (Medicare Payment Advisory Commission [MedPAC], 2012). The growth in spending is unsustainable and highlights the need to understand the value of care Medicare buys with every dollar spent.

Given the urgency of the Medicare Hospital Insurance Trust Fund and the fact that Medicare pays for 40% to 50% of hospitalizations nationally (Centers for Disease Control and Prevention [CDC], 2012), hospital costs are a natural venue in which to deconstruct payments for Medicare patients. Yet payments to hospitals are difficult to interpret in isolation. Some high-payment hospitals may have better clinical outcomes when compared with low-payment hospitals; other-high payment hospitals may not. For this reason, the value of hospital care is more clearly assessed when pairing hospital payments with hospital quality.

A measure of payments for Medicare patients to hospitals that is aligned with current quality of care measures will facilitate profiling hospital value (payments and quality). The Centers for Medicare & Medicaid Services (CMS) developed a measure of payments for Medicare patients that reflects differences in the management of care for patients with acute myocardial infarction (AMI) both during hospitalization and immediately post-discharge. AMI is a condition with substantial variation in costs of care and for which there are well-established publicly reported quality measures, and is therefore an ideal condition for assessing relative value for an episode of care that begins with an acute hospitalization. By focusing on one specific condition, value assessments may provide actionable feedback to hospitals and incentivize targeted improvements in care.

## Evidence for Rationale

Ash AS, Byrne-Logan S. How well do models work? Predicting health care costs. Alexandria (VA): American Statistical Association; 1998. 8 p. [4 references]

Centers for Disease Control and Prevention (CDC). National Hospital Discharge Survey. [internet]. Atlanta (GA): Centers for Disease Control and Prevention (CDC); [accessed 2012 Aug 07].

Medicare Payment Advisory Commission (MedPAC). Report to the Congress: Medicare payment policy. Washington (DC): Medicare Payment Advisory Commission (MedPAC); 2012 Mar.

Yale New Haven Health Services Corporation (YNHHSC), Center for Outcomes Research & Evaluation (CORE). Hospital-level, risk-standardized payment associated with a 30-day episode of care for AMI (version 1.0): 2012 measure methodology report. Baltimore (MD): Centers for Medicare & Medicaid Services (CMS); 2012 Sep. 71 p. [19 references]

## Primary Health Components

Acute myocardial infarction (AMI); 30-day episode of care payment

## Denominator Description

The measure cohort includes acute inpatient admissions for Medicare Fee-for-Service (FFS) beneficiaries aged 65 years or older discharged from non-federal acute care hospitals and critical access hospitals, with a principal discharge diagnosis of acute myocardial infarction (AMI).

The risk-standardized payment (RSP) is calculated as the ratio of the "predicted" payment to the "expected" payment at a given hospital, multiplied by the national mean payment. For each hospital, the denominator is the payment expected based on the nation and the specific hospital's case mix.

See the related "Denominator Inclusions/Exclusions" field.

Note: This outcome measure does not have a traditional numerator and denominator like a core process measure; thus, this field is used to define the measure cohort.

See the [2017 Measures Updates and Specifications Report: Hospital-level Risk-standardized Payment Measures](#)  for more details.

## Numerator Description

The measure reports total payments associated with an episode of care for acute myocardial infarction (AMI).

The risk-standardized payment (RSP) is calculated as the ratio of the "predicted" payment to the "expected" payment at a given hospital, multiplied by the national mean payment. For each hospital, the numerator of the ratio is the payment predicted based on the specific hospital and its observed case mix.

See the related "Numerator Inclusions/Exclusions" field.

Note: This outcome measure does not have a traditional numerator and denominator like a core process measure; thus, this field is used to define the outcome.

See the [2017 Measures Updates and Specifications Report: Hospital-level Risk-standardized Payment Measures](#)  for more details.

## Evidence Supporting the Measure

### Type of Evidence Supporting the Criterion of Quality for the Measure

One or more research studies published in a National Library of Medicine (NLM) indexed, peer-reviewed journal

### Additional Information Supporting Need for the Measure

Acute myocardial infarction (AMI) is a common condition in the elderly with substantial variability in payments due to different practice patterns. Quality measures for AMI such as 30-day AMI risk-standardized mortality rate (RSMR) are already publicly reported. In the context of its publicly reported quality measures, AMI is an ideal condition in which to assess payments for Medicare patients and relative hospital value. Therefore, we created a measure of payments for a 30-day episode of care for AMI that could be aligned with the Centers for Medicare & Medicaid's (CMS's) 30-day AMI mortality and readmission measures. This will allow CMS to assess the value of care provided for these episodes.

A preliminary examination of the 30-day AMI risk-standardized mortality and risk-standardized payment measures showed high quality care (as measured by RSMR) at higher and lower relative costs. This finding illustrated that quality care can be provided at relative lower costs and that efficiencies of care can be optimized for AMI.

### Evidence for Additional Information Supporting Need for the Measure

DeBuhr J. (Research Associate II, Yale University Center for Outcomes Research and Evaluation (CORE), New Haven, CT). Personal communication. 2017 Dec 12. 1 p.

## Extent of Measure Testing

Assessment of Updated Models

The acute myocardial infarction (AMI) payment measure estimates hospital-specific episode-of-care risk-standardized payment (RSPs) using a hierarchical generalized linear model. Refer to Section 2 in the original measure documentation for a summary of the measure methodology and model risk-adjustment variables. Refer to prior methodology and technical reports for further details.

The Centers for Medicare & Medicaid Services (CMS) evaluated and validated the performance of the AMI model using July 2013 to June 2016 data for the 2017 reporting period. They also evaluated the stability of the risk-adjustment model over the three-year measurement period by examining the model variable frequencies, model coefficients, and the performance of the risk-adjustment model in each year.

CMS assessed generalized linear model performance in terms of discriminant ability for each year of data and for the three-year combined period. Two summary statistics for assessing model performance were computed: the predictive ratio and a quasi- $R^2$ . For a traditional linear model (that is, ordinary least squares regression),  $R^2$  is interpreted as the amount of variation in the observed outcome that is explained by the predictor variables (patient-level risk factors). Generalized linear models, however, do not output an  $R^2$  that is akin to the  $R^2$  of a traditional linear model. A "quasi- $R^2$ " was produced by regressing the total payment outcome on the predicted outcome. Specifically, CMS regressed the total payment on the payment predicted by the patient-level risk factors.

The results of these analyses are presented in Section 4.2 of the original measure documentation.

#### AMI Payment 2017 Model Results

##### *Frequency of AMI Model Variables*

CMS examined the change in the frequencies of clinical and demographic variables. Frequencies of model variables were stable over the measurement period. There were no notable changes (greater than 2% absolute change) in the frequencies.

##### *AMI Model Parameters and Performance*

Table 4.2.2 in the original measure documentation shows the hierarchical generalized linear regression model variable coefficients by individual year and for the combined three-year dataset. Table 4.2.3 in the original measure documentation shows the risk-adjusted payment ratios and 95% confidence intervals for the AMI payment model by individual year and for the combined three-year dataset. The quasi- $R^2$  for the AMI payment model was 0.08, suggesting that approximately 8% of the variation in payment can be explained by patient-level risk factors. This quasi- $R^2$  is in line with  $R^2$ s from other patient-level risk-adjustment models for healthcare payment (Pope et al., 2011).

Overall, the variable effect sizes were relatively constant across years. In addition, model performance was stable over the three-year time period; the quasi- $R^2$  and predictive ratios remained similar to the model used for 2016 public reporting.

Refer to the original measure documentation for additional information.

## Evidence for Extent of Measure Testing

Pope G, Kautter J, Ingber M, Freeman S, Sekar R, Newhard C. Evaluation of the CMS-HCC risk adjustment model: final report. Research Triangle Park (NC): RTI International; 2011 Mar. 119 p.

Yale New Haven Health Services Corporation (YNHHSC), Center for Outcomes Research and Evaluation (CORE). 2017 measure updates and specifications report: hospital-level risk-standardized payment measures. Baltimore (MD): Centers for Medicare & Medicaid Services (CMS); 2017 Mar. 94 p.

## State of Use of the Measure

## State of Use

Current routine use

## Current Use

not defined yet

# Application of the Measure in its Current Use

## Measurement Setting

Hospital Inpatient

## Professionals Involved in Delivery of Health Services

not defined yet

## Least Aggregated Level of Services Delivery Addressed

Single Health Care Delivery or Public Health Organizations

## Statement of Acceptable Minimum Sample Size

Specified

## Target Population Age

Age greater than or equal to 65 years

## Target Population Gender

Either male or female

# National Strategy for Quality Improvement in Health Care

## National Quality Strategy Aim

Affordable Care

## National Quality Strategy Priority

# Institute of Medicine (IOM) National Health Care Quality

# Report Categories

## IOM Care Need

Not within an IOM Care Need

## IOM Domain

Not within an IOM Domain

# Data Collection for the Measure

## Case Finding Period

Discharges July 1, 2013 through June 30, 2016

## Denominator Sampling Frame

Patients associated with provider

## Denominator (Index) Event or Characteristic

Clinical Condition

Institutionalization

Patient/Individual (Consumer) Characteristic

## Denominator Time Window

not defined yet

## Denominator Inclusions/Exclusions

### Inclusions

An *index admission* is the hospitalization that begins the episode-of-care payment window and includes admissions for patients:

- Having a principal discharge diagnosis of acute myocardial infarction (AMI)\*

- Enrolled in Medicare Fee-for-Service (FFS) Part A and Part B for the 12 months prior to the date of the admission, and enrolled in Part A and Part B during the index admission

- Aged 65 or over

- Not transferred from another acute care facility

\*International Classification of Diseases, Tenth Revision, Clinical Modification (ICD-10-CM) codes used to define the AMI cohort for discharges on or after October 1, 2015:

- I21.01 ST elevation myocardial infarction (STEMI) involving left main coronary artery

- I21.02 STEMI involving left anterior descending coronary artery

- I21.09 STEMI involving other coronary artery of anterior wall

- I21.11 STEMI involving right coronary artery

- I21.19 STEMI involving other coronary artery of inferior wall

- I21.21 STEMI involving left circumflex coronary artery

I21.29 STEMI involving other sites  
I21.3 STEMI of unspecified site  
I21.4 Non-ST elevation (NSTEMI) myocardial infarction

Note: International Classification of Diseases, Ninth Revision (ICD-9) code lists for discharges prior to October 1, 2015 can be found in the [2016 Measures Updates and Specifications Report: Hospital-level Risk-standardized Payment Measures](#) .

## Exclusions

Discharged alive on the day of admission or the following day who were not transferred to another acute care facility  
Inconsistent or unknown patient vital status or other unreliable demographic (age and gender) data  
Incomplete administrative data in the 30 days following the start of the index admission if discharged alive  
Enrolled in the Medicare hospice program any time in the 12 months prior to the index admission, including the first day of the index admission  
Discharged against medical advice  
Transferred to a federal hospital  
Not matched to admission in the AMI mortality measure  
Missing index diagnosis-related group (DRG) weight where provider received no payment

For patients with more than one eligible admission for AMI in a single year, only one index admission for that condition is randomly selected for inclusion in the cohort. Additional admissions within that year are excluded.

## Exclusions/Exceptions

not defined yet

## Numerator Inclusions/Exclusions

### Inclusions

The measure reports total payments associated with an episode of care for acute myocardial infarction (AMI).

The measure captures payments for Medicare patients across multiple care settings, services, and supplies (that is, inpatient, outpatient, skilled nursing facility [SNF], home health, hospice, physician/clinical laboratory/ambulance services, durable medical equipment, prosthetics/orthotics, and supplies).

The risk-standardized payment (RSP) is calculated as the ratio of the "predicted" payment to the "expected" payment at a given hospital, multiplied by the national mean payment. For each hospital, the numerator of the ratio is the payment predicted based on the specific hospital and its observed case mix.

Note: This outcome measure does not have a traditional numerator and denominator like a core process measure; thus, this field is used to define the outcome.

See the [2017 Measures Updates and Specifications Report: Hospital-level Risk-standardized Payment Measures](#)  for more details.

### Exclusions

Payment adjustments unrelated to clinical care decisions are not considered in the measure outcome

## Numerator Search Strategy

Institutionalization

## Data Source

Administrative clinical data

## Type of Health State

Does not apply to this measure

## Instruments Used and/or Associated with the Measure

None

## Computation of the Measure

### Measure Specifies Disaggregation

Does not apply to this measure

### Scoring

Ratio

### Interpretation of Score

Does not apply to this measure (i.e., there is no pre-defined preference for the measure score)

### Allowance for Patient or Population Factors

not defined yet

### Description of Allowance for Patient or Population Factors

#### Risk-Adjustment Variables

In order to account for differences in case mix among hospitals, the measure adjusts for variables (for example, age, comorbid disease, and indicators of patient frailty) that are clinically relevant and have relationships with the outcome. For each patient, risk-adjustment variables are obtained from inpatient, outpatient, and physician Medicare administrative claims data extending 12 months prior to, and including, the index admission.

The measure adjusts for case mix differences among hospitals based on the clinical status of the patient at the time of the index admission. Accordingly, only comorbidities that convey information about the patient at that time or in the 12 months prior, and not complications that arise during the course of the hospitalization, are included in the risk adjustment.

The measure does not adjust for socioeconomic status (SES) because the association between SES and health outcomes can be due, in part, to differences in the quality of healthcare that groups of patients with varying SES receive. The intent is for the measure to adjust for patient demographic and clinical characteristics while illuminating important payment differences. As part of the National Quality Forum's (NQF's) endorsement process for this measure, the Centers for Medicare & Medicaid Services (CMS) completed analyses for the two-year Sociodemographic Trial Period. Although bivariate analyses found that the average total payments is higher for dual-eligible patients (for patients living in lower Agency for

Healthcare Research and Quality [AHRQ] SES Index census block groups) and African-American patients compared with all other patients, analyses in the context of a multivariable model demonstrated that the effect size of these variables was small, and that the quasi-R<sup>2</sup> values for the models are similar with and without the addition of these variables.

Refer to Appendix D in the original measure documentation for the list of comorbidity risk-adjustment variables and list of complications that are excluded from risk adjustment if they occur only during the index admission.

## Standard of Comparison

not defined yet

## Identifying Information

### Original Title

Hospital-level RSP associated with a 30-day episode of care for AMI.

### Measure Collection Name

National Hospital Inpatient Quality Measures

### Measure Set Name

Payment Measures

### Submitter

Centers for Medicare & Medicaid Services - Federal Government Agency [U.S.]

### Developer

Centers for Medicare & Medicaid Services - Federal Government Agency [U.S.]

Yale-New Haven Health Services Corporation/Center for Outcomes Research and Evaluation under contract to Centers for Medicare & Medicaid Services - Academic Affiliated Research Institute

### Funding Source(s)

Centers for Medicare & Medicaid Services (CMS)

### Composition of the Group that Developed the Measure

This measure was developed by a team of experts:

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Donald Casey, MD, New York University Langone Medical Center

Lesley Curtis, PhD, Duke University  
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## Financial Disclosures/Other Potential Conflicts of Interest

Unspecified

## Endorser

National Quality Forum - None

## NQF Number

not defined yet

## Date of Endorsement

2016 Nov 7

## Measure Initiative(s)

Hospital Compare

Hospital Inpatient Quality Reporting Program

## Adaptation

This measure was not adapted from another source.

## Date of Most Current Version in NQMC

2017 Mar

# Measure Maintenance

Annual

## Date of Next Anticipated Revision

2018 Apr

## Measure Status

This is the current release of the measure.

This measure updates a previous version: Specifications manual for national hospital inpatient quality measures, version 5.0b. Centers for Medicare & Medicaid Services (CMS), The Joint Commission; Effective 2015 Oct 1. various p.

## Measure Availability

Source available from the [QualityNet Web site](#) .

Check the QualityNet Web site regularly for the most recent version of the specifications manual and for the applicable dates of discharge.

## Companion Documents

The following are available:

Hospital compare: a quality tool provided by Medicare. [internet]. Washington (DC): U.S. Department of Health and Human Services; [accessed 2017 Nov 10]. Available from the [Medicare Web site](#)

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Yale New Haven Health Services Corporation (YNHHSC), Center for Outcomes Research and Evaluation (CORE). 2017 Medicare hospital quality chartbook. Baltimore (MD): Centers for Medicare & Medicaid Services (CMS); 2017. Available from the [CMS Web site](#) .

Yale New Haven Health Services Corporation (YNHHSC), Center for Outcomes Research and Evaluation (CORE). 2017 payment measures updates and specifications report: supplemental ICD-10 code lists for use with claims for discharges on or after October 1, 2015. Baltimore (MD): Centers for Medicare & Medicaid Services (CMS); 2017. Available from the [QualityNet Web site](#)

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## NQMC Status

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# Production

## Source(s)

Yale New Haven Health Services Corporation (YNHHSC), Center for Outcomes Research and Evaluation (CORE). 2017 measure updates and specifications report: hospital-level risk-standardized payment measures. Baltimore (MD): Centers for Medicare & Medicaid Services (CMS); 2017 Mar. 94 p.

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